

Claims

1. An acrylic urethane (meth)acrylate oligomer composition, obtainable from the reaction of an acrylic polymer polyol, a diisocyanate and a hydroxy(meth)acrylate, the acrylic urethane (meth)acrylate oligomer composition responding to the following structure 1 :
 5 hydroxy(meth)acrylate-(diisocyanate-acrylic polyol)_n-diisocyanate-hydroxy(meth)acrylate
 ("structure 1")
 where n is 1 to 10.
- 10 2. The oligomer composition according to claim 1, wherein the acrylic polymer polyol comprises a reaction product of a polymer or copolymer of acrylic monomers with a hydroxy containing chain transfer agent, a hydroxy containing initiator or mixtures thereof.
- 15 3. The oligomer composition according to claim 2, wherein the acrylic monomers comprise ethyl acrylate, ethyl hexyl acrylate, and/or butyl acrylate.
4. The oligomer composition according to claim 1, wherein n is 2 to 6.
- 20 5. The oligomer composition according to claim 1, wherein the acrylic polymer polyol has a number average molecular weight as measured by gel permeation chromatography of 1000 to 5000.
- 25 6. The oligomer composition according to claim 1, wherein the diisocyanate comprises 3-isocyanatomethyl-3,5,5-trimethylcyclohexylisocyanate, 2,4-toluene diisocyanate, 2,6-toluene diisocyanate, 4,4'-diphenylmethane diisocyanate, 2,4'-diphenylmethane diisocyanate, 4,4'-dicyclohexyldiisocyanate, meta- and para-tetramethyl xylene diisocyanate, hydrogenated meta-tetramethyl xylene diisocyanate, hexamethylene diisocyanate, norbornane diisocyanate, 2,2,4- and 2,4,4-trimethylenehexamethylene diisocyanate, 1,5-naphthylene diisocyanate, dianisidine diisocyanate, di(2-isocyanatoethyl)bicyclo[2.2.1]-hept-5-ene-2,3-dicarboxylate, 2,4-bromotoluene diisocyanate, 2,6-bromotoluene diisocyanate, 4-bromo-meta-phenylene diisocyanate, 4,6-dibromo-meta-phenylene diisocyanate or mixtures thereof.
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7. The oligomer composition according to claim 1, wherein the diisocyanate comprises 3-isocyanatomethyl-3,5,5-trimethylcyclohexylisocyanate, 2,4-toluene diisocyanate, 2,6-toluene diisocyanate or mixtures thereof.

5 8. The oligomer composition according to claim 1, wherein the hydroxy(meth)acrylate comprises 2-hydroxyethyl acrylate, 2-hydroxyethylmethacrylate, 2-hydroxypropyl(meth)acrylate, 3-hydroxypropyl(meth)acrylate, 2-hydroxybutyl(meth)acrylate, 4-hydroxybutyl(meth)acrylate, 3-hydroxypentyl(meth)acrylate, 6-hydroxynonyl(meth)acrylate, 2-hydroxy and 5-
10 hydroxypentyl(meth)acrylate, 7-hydroxyheptyl(meth)acrylate, 5-hydroxydecyl(meth)acrylate, diethylene glycol mono(meth)acrylate, polyethylene glycol mono(meth)acrylate, propylene glycol mono(meth)acrylate, polypropylene glycol mono(meth)acrylate, (meth)acrylates combining ethoxylation and propoxylation, caprolactone-2-hydroxyethyl acrylate adducts or mixtures thereof.

15 9. The oligomer composition according to claim 1, wherein the hydroxy(meth)acrylate comprises 2-hydroxyethyl acrylate, 2-hydroxyethylmethacrylate, polypropylene glycol monoacrylate, polyethylene glycol monoacrylate, caprolactone-2-hydroxyethyl acrylate adducts or mixtures thereof.

20 10. The oligomer composition according to claim 1, which has an unreacted hydroxy(meth)acrylate content of less than 1% by weight.

25 11. The oligomer composition according to claim 1, which has a diisocyanate diacrylate content of less than 5 % by weight.

30 12. A one pot process for making the oligomer composition according to claim 1, which comprises reacting the acrylic polymer polyol, diisocyanate, and hydroxy(meth)acrylate in an amount such that the ratio of molar equivalents of isocyanate provided by the diisocyanate to the molar equivalent of hydroxy groups provided by the acrylic polymer polyol is higher than 1 and lower than 2.2.

13. The process according to claim 12, which comprises reacting the acrylic polymer polyol, diisocyanate, and hydroxy(meth)acrylate in an amount such that the ratio of molar

equivalents of hydroxy groups provided by the acrylic polymer polyol to the molar equivalent of hydroxy groups provided by the hydroxy(meth)acrylate is higher than 0.95.

14. The process according to claim 12, wherein the acrylic polymer polyol and
5 diisocyanate are reacted to obtain a reaction product, which reaction product is then reacted with the hydroxy(meth)acrylate.
15. The process according to claim 12, wherein the diisocyanate and
hydroxy(meth)acrylate are reacted to obtain a reaction product, which reaction product is
10 then reacted with the acrylic polymer polyol.
16. The process according to claim 12, which is conducted without a solvent.
17. The process according to claim 12, which is performed without stripping of solvent,
15 unreacted hydroxy(meth)acrylate or diisocyanate.
18. An energy curable ink composition, which comprises the oligomer composition according to claim 1.
- 20 19. The ink composition according to claim 18, which further comprises at least one ingredient selected from the group consisting of pigments, resins, diluents, waxes, greases, plasticizers, stabilizers, photoinitiators, curing agents, thickeners, fillers, inhibitors, wetting agents, flow agents, leveling agents, and adhesion promoters.
- 25 20. An article of manufacture, comprising a substrate having a surface coated with the energy curable ink composition according to claim 18, which has been subjected to energy curing.
- 30 21. An article of manufacture according to claim 20, wherein the ink composition is a laminating ink composition.
22. The ink composition according to claim 18, which has a color of black, cyan, magenta or yellow, a low ink misting of $\Delta E \leq 6$, and a 90-100% adhesion to vinyl, polystyrene and polycarbonate.